



## New Strategies for Green Butanol Production

Pinto, Tiago ; Junicke, Helena; Flores Alsina, Xavier; Gernaey, Krist V.

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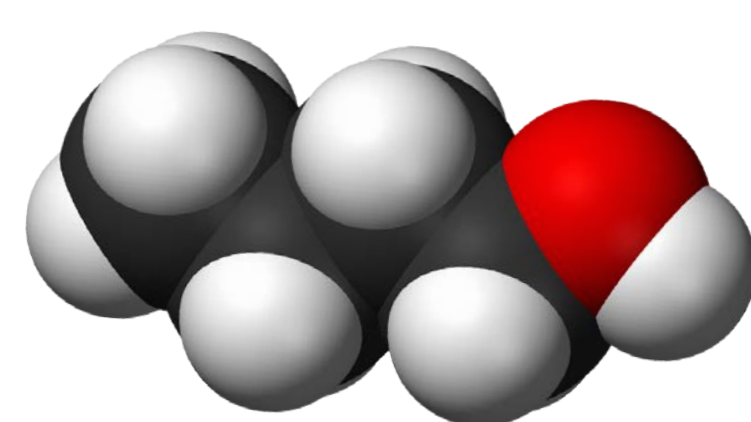
## Motivation

New national and international policies are pushing for a more sustainable production landscape. Once seen as waste, many resources are now the focus of valorization and recovery. Mixed culture biotechnology is held as a promising solution for producing valuable biofuels and chemicals from such low-value substrates and waste streams. In this context, butanol is a biofuel of particular interest.

## Why biobutanol?

50% higher energy density than ethanol

Properties similar to gasoline



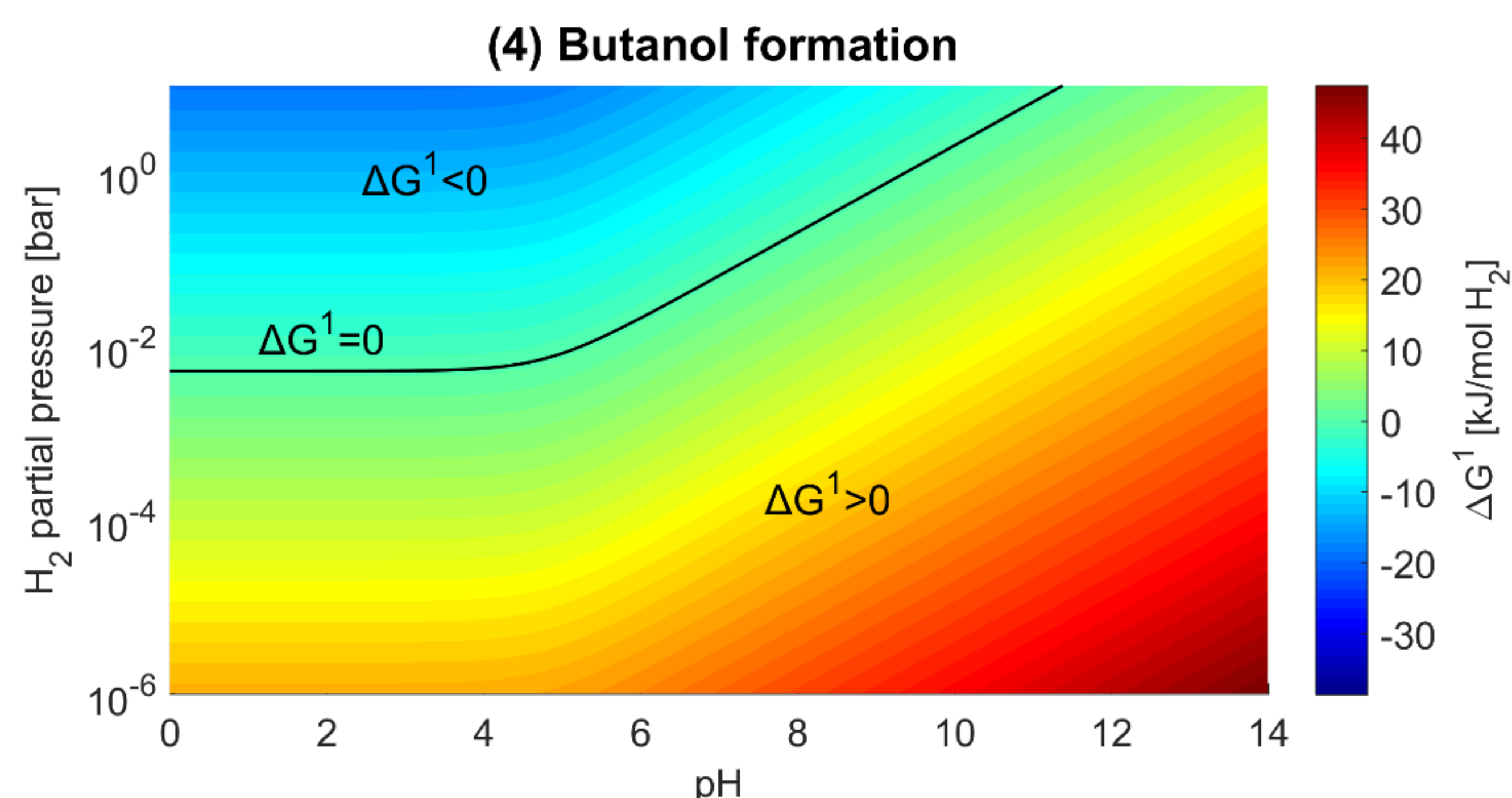
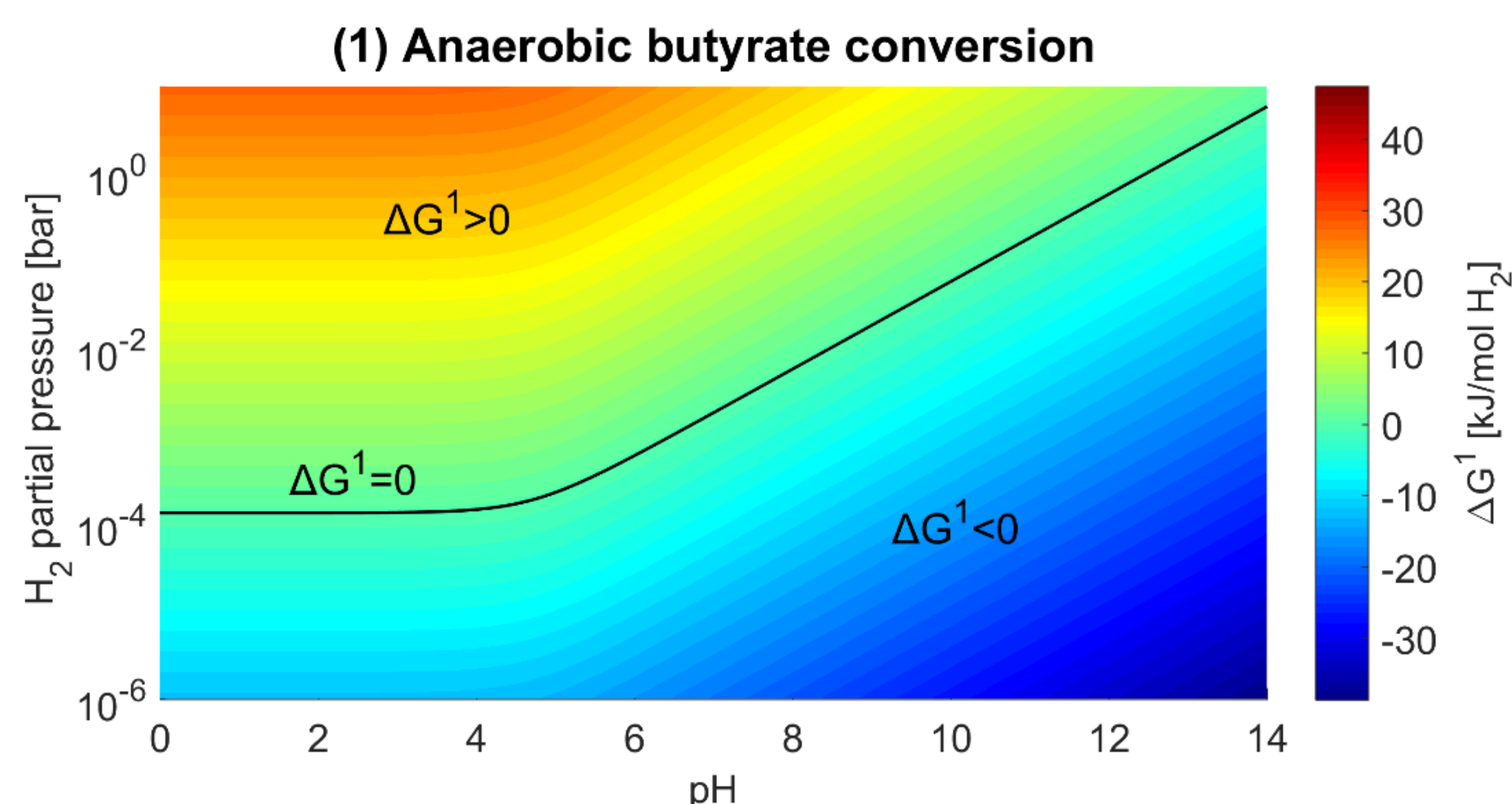
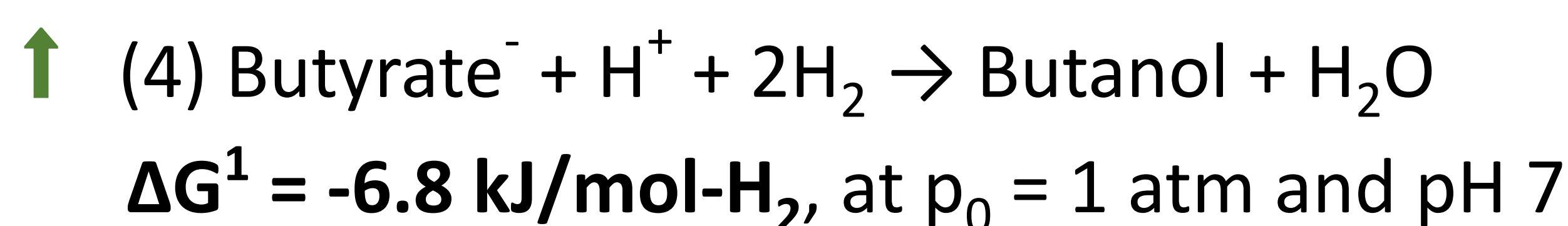
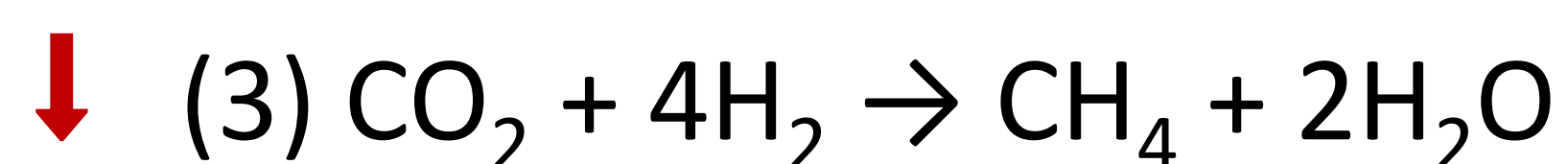
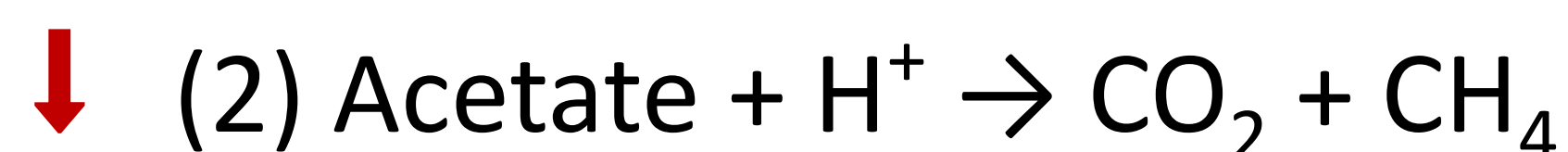
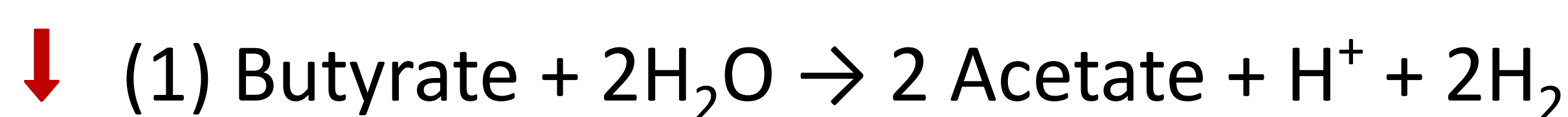
Drop-in replacement for fossil transport fuels

## Why microbial mixed cultures?

Microbial mixed culture	Sterile pure culture
Cheap waste streams (non-sterile)	Expensive high-grade substrates (sterile)
Continuous	(Fed) batch
Ecological selection	Genetic engineering
Resource and energy recovery	Single product, maximized yield

## Enrichment strategy

Starting from non-defined methanogenic communities **fed on butyrate and H<sub>2</sub>**, butanol-producing microorganisms are enriched through directed ecological selection in a continuously-stirred tank reactor. Operating at **high H<sub>2</sub> partial pressure of 1.0 to 1.5 bar**, (1) anaerobic butyrate conversion becomes thermodynamically unfavorable, and thus also (2) acetoclastic and (3) hydrogenotrophic methanogenesis, reducing the amount of CH<sub>4</sub> and CO<sub>2</sub> produced as by-products.



Only high H<sub>2</sub> partial pressure is not sufficient to promote butyrate reduction to butanol. As such, by controlling the **fermentation at pH 5** we will further inhibit (1) anaerobic butyrate conversion while favoring (4) butanol formation.

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